

## Remarks

Claims 1 and 8 are amended to specify that the work roll in these embodiments of the present invention is that used in the manufacture of sheet steel and other sheet metal products. These amendments are supported in the specification, at least at ¶ 0002.

Claims 1 and 8 are also amended to specify that the sensor used in these embodiments of the present invention is a capacitance sensor or an inductance sensor. Support for these amendments to claims 1 and 8 can be found in the specification, at least at ¶ 0018.

Claim 5, which was dependent from claim 1, is rewritten in independent form to incorporate the limitations of claim 1. As such, the amendments to claim 5 are supported in the specification and do not add new matter.

New claim 17 is added which recites a method of measuring the shape or surface characteristics of a work roll with a sensor having multiple measuring probes for simultaneously measuring two or more of crown, taper, Ra, PPI, traverse and body diameter. As such, claim 17 recites a method with the apparatus of claim 5. This new claim combines the limitations of claim 8, prior to the within amendment, with the limitations of claim 5 which the Examiner indicates recites allowable subject matter. Accordingly, new claim 17 is supported in the specification and does not add new matter.

New claims 18-20 are dependent from claim 17. These claims recite the same limitations as claims 9, 11 and 12, which are dependent from the other independent

method claim in the instant application, claim 8. Accordingly, new claims 18-20 are supported in the specification and do not add new matter.

At page 5 of the Office Action, the Examiner objects to claim 5 as being dependent from a rejected base claim and indicates that the claim would be allowable if rewritten in independent form. The applicant gratefully acknowledges this indication of allowability. Claim 5 was dependent from claim 1 and is amended herein to include all of the limitations of claim 1. Claim 17 is added to the application which recites a method for measuring the shape and surface characteristics of a work roll with the novel and unique apparatus of claim 5 and claims 18-20 are dependent from claim 17. Based on the amendments to claim 5, this claim is in condition for allowance. Also, considering that claim 17 recites a method with the apparatus of claim 5, claim 17 and dependent claims 18-20 should, likewise, be in condition for allowance. Hence, a notice of allowance of claims 5 and 17-20 is respectfully requested. Also, as discussed below, the other claims pending in the instant application, as amended herein, are neither anticipated by nor obvious over the prior art. Accordingly, a notice of allowance for all the pending claims is respectfully requested.

At pages 2-3 of the Office Action, claims 1, 2, 4 and 6-16 are rejected under 35 U.S.C. §103(a) as being obvious over Hirayama, in view of White or Tait and further in view of Nakumura, Izawa or Honma. Reconsideration and withdrawal of this rejection is respectfully requested.

The invention of claims 1, 2, 4 and 6-16 has to do with a non-contact apparatus comprising a capacitance sensor or inductance sensor and method for measuring the surface characteristics of work rolls used in the manufacture of sheet steel and other

sheet metal products. Before the present invention, mechanical contact measuring devices were used to take measurements of surface properties, but such devices did not provide acceptable accuracy, repeatability or resolution. Applicant's claimed invention requires a non-contact capacitance or inductance sensor and a means for moving the sensor along a rail at a non-contact measuring distance from the surface of a work roll and in a line which is in parallel with the center line of the work roll. A means of collecting shape or surface characteristics data from the sensor is also required. None of the cited art considered alone or in the various combinations set forth in the Office Action would anticipate or render obvious applicant's claimed invention.

Hirayama has to do with a device for measuring the gloss of electroconductive rollers used in an image forming apparatus such as copiers and laser printers. This art is totally unrelated to the art of work rolls used in the manufacture of sheet steel and other sheet metal products which is the subject of applicant's invention. Moreover, Hirayama concerns gloss meters and not capacitance or inductance sensors. It is well understood in the art that gloss meters measure the specular reflection using light intensity registered over a small range of the reflection angle. This is entirely unrelated to the sensors used in the present invention.

The independent claims rejected by the Examiner under Hirayama and the secondary references have been amended to specify that the apparatus and methods pertain to work rolls used in the manufacture of sheet steel and other sheet metal products and that the apparatus and methods involve capacitance or inductance sensors. Hirayama, which concerns a gloss meter that uses light in an art unrelated to the work rolls of the present invention, provides no teaching or suggestion of the

apparatus of claim 1 and method of claim 8 which require that the works rolls are those used in the manufacture of sheet steel and other sheet metal products and that the sensors are capacitance or inductance sensors. Accordingly, the present invention, including the embodiment set forth in independent claims 1 and 8 and the pending claims dependent therefrom, is not obvious over Hirayama and, as such cannot be obvious over Hirayama, in view of White or Tait and further in view of Nakumura, Izawa or Honma.

In the Office Action, the Examiner asserts that White teaches a motorized threaded rail to drive a sensor and Tait teaches use of a rail to support a sensor as it is displaced across a roller of interest. The Examiner further asserts that both White and Tait teach data collection and recording. The Examiner also refers to Nakumura, Izawa or Honma for the assertion that the roll of Hirayama is a work roll.

As discussed above, Hirayama concerns a gloss meter and provides absolutely no teaching or suggestion of an apparatus or method involving either a capacitance sensor or an inductance sensor. Neither White nor Tait can remedy this deficiency of Hirayama in that both White and Tait teach of sensors in contact with the surface of a roll. Thus, regardless of any teaching in White or Tait of rails and data collection and recording, the combination of Hirayama with White or Tait cannot teach or suggest an apparatus having a non-contact capacitance sensor or inductance sensor caused to move along the work roll by the means set forth in claims 1 and 8 of the instant application. At best the combination of these references teach of moving a gloss meter along the roll for the photocopier industry and not the specific sensors set forth in the amended claims for measuring the shape or surface characteristics of a work roll used

in the manufacture of sheet steel and other sheet metal products, as set forth in the amended claims. As such, the present invention is not obvious over Hirayama, in view of White or Tait, and therefore cannot be obvious over Hirayama, in view of White or Tait and further in view of Nakumura, Izawa or Honma.

The Examiner cites Nakumura, Izawa or Honma to allegedly show that the roll of Hirayama used in the photocopier industry is a roll that does work. All three of these secondary references, however, concern printing or imaging. The term work roll in the present invention is a term of art relevant to sheet metal fabrication and the claims have been amended to specify that the work rolls pertinent to the present invention are those used in the manufacture of sheet steel and other sheet metal products. The references cited by the Examiner to support the assertion that the roll of Hirayama may be a work roll concern the printing or imaging industry and, thus, provide no teaching to the art of an apparatus and method used for measuring the shape or surface characteristics of work rolls in the sheet steel and sheet metal industry. This combination of references does not provide any teaching or suggestion of such an apparatus or method having a non-contact capacitance sensor or inductance sensor with the other elements of claims 1 and 8 of the instant application. As such, the present invention is not obvious over Hirayama, in view of White or Tait and further in view of Nakumura, Izawa or Honma.

At page 3 of the Office Action, the Examiner presents further remarks with respect to the application of the references, particularly Hirayama and White to claims 4, 6, 7 and 9-16. These claims are all directly or indirectly dependent from claims 1 and 8 and, as such, would not be obvious over Hirayama, in view of White or Tait and further in view of Nakumura, Izawa or Honma for the reasons stated above.

Claims 1-4, 6-9 and 11-16 are rejected under 35 U.S.C. §103(a) as being obvious over Popovic in view of White or Tait and further in view of Nakumura, Izawa or Honma. Reconsideration and withdrawal of this rejection is respectfully requested.

The Examiner asserts that Popovic teaches a device that includes a capacitive probe mounted on a floating device and a data acquisition computer and there is no clear description of an assembly that moves the device. The Examiner, however, asserts that White teaches a motorized threaded rail to drive a sensor and Tait teaches use of a rail to support a sensor as it is displaced across a roller of interest. The Examiner also refers to Nakumura, Izawa or Honma for the assertion that the roll of Popovic is a work roll. The Examiner further notes that as to claims 4 and 9 the recorded display of Tait and White's display allow for an operator to immediately recognize results, as to claims 6 and 7 the axis of the probe must follow the axis of the roll for correlation of results of sensor measurement with the location of those measurements, as to claims 11 and 12 measurements may be made quickly for averaging and as to claims 15 and 16 "Popovic's capacitive sensor is as analog as Applicant's sensor of claim 3".

As discussed above, the present invention is an apparatus and method for measuring the shape or surface characteristics of a work roll used in the manufacture of sheet steel and other sheet metal products, and the claims are amended accordingly. None of the references cited in the Office Action provide any teaching or suggestion of measurement apparatus or methods pertinent to measuring the shape or surface

characteristics of a work roll in the manufacture of sheet steel and other sheet metal products. Popovic states that his device is intended for constant distance contact less devices and mentions that the device may be used for fields such as charge sensing probes for xerography, print heads for ink jet printing, ion stream heads for ionography, extrusion dies for coating, LED image exposure bars, and the like. (See, Popovic at column 1, lines 5-14.) None of these are relevant to the manufacture of sheet steel and other sheet metal products. Indeed, as discussed in the response submitted by the applicants on September 13, 2005, constant distance devices provide no teaching or suggestion of sensors useful in the claimed apparatus and methods of the present invention because it would not be possible for applicant's invention to measure certain surface characteristics such as crown and taper if a constant distance was maintained between the sensor and the surface of the work roll. Neither White nor Tait remedy the deficiencies of Popovic in that these references concern contact sensors and do not provide any teaching or suggestion of an apparatus or method for measuring the shape or surface characteristics of a work roll used in the manufacture of sheet steel and other sheet metal products. The Examiner refers to Nakumura, Izawa or Honma to argue that the Popovic refers to a "work roll", however, those references concern rolls in the printing and imaging industry and, thus, provide no teaching to the art of devices and methods for measuring the shape and surface characteristics of work rolls in the sheet steel and sheet metal industry and, as discussed above, the term work roll in the claims is a term of art. At best the combination of Nakumura, Izawa or Honma with Popovic in view of White or Tait may teach of applying the technology of Popovic in view of White or Tait to the printing or imaging industry. Certainly, the combination of

references cited by the Examiner in this claim rejection provide no motivation, or teaching or suggestion, to one skilled in the art of any measurement device for shape or surface characteristics of work rolls used in sheet steel and sheet metal manufacture, let alone the specific apparatuses and methods claimed in the instant application. As such, the present invention, as set forth in the amended claims, is not obvious over Popovic in view of White or Tait and further in view of Nakamura, Izawa or Honma.

At page 5 of the Office Action, the Examiner rejects claims 1, 2, 8-10, and 13-16 under 35 U.S.C. § 102(b) as being anticipated by Tuck. Reconsideration and withdrawal of this rejection is respectfully requested.

The Examiner asserts that Tuck teaches a non-contact device including an optical sensor to measure the diameter of a pilger mill mandrel, guide rails, a motor to move the sensor parallel to the mandrel and computer memory. The Examiner further asserts that the mandrel is used for cold rolling and thus a work roll, the data must be displayed for use and Tuck measures diameter. As to claim 15, the Examiner asserts that analog instrumentation is applied with a laser/optics sensor.

Tuck concerns a laser micrometer instrument used for measuring the outer diameter of a mandrel. In the present invention set forth in claims 1 and 8, as amended, and the claims dependent therefrom, a capacitance or inductance sensor is used to measure surface characteristics of a work roll in the manufacture of sheet steel and other sheet metal products. Tuck, which discloses a laser micrometer to measure diameter, does not expressly or inherently disclose an apparatus or method using a capacitance sensor or inductance sensor as in the present invention, and the claims are

amended accordingly. Based on the foregoing, the present invention, as set forth in the amended claims, is not anticipated by Tuck.

The present invention is also not obvious over Tuck. In the present invention of claims 1 and 8, a capacitance or inductance sensor is used to measure various surface characteristics of a work roll in the sheet steel or sheet metal industry. The sensor measures the air gap between the sensor and sample piece as a means to obtain data. In the laser meter of Tuck, a laser beam is directed to the mandrel and scans the mandrel to obtain data in a stepwise manner. The device used to obtain data in Tuck is different from the mode used by a capacitance or inductance sensor as in the embodiments of claims 1 and 8, and the claims dependent therefrom, which measures air gap. Considering these differences, the disclosure of Tuck which concerns laser measurement does not teach or suggest the use of a capacitance or inductance sensor as in the present invention. As such, the present invention, as set forth in the amended claims, is not obvious over Tuck.

Also, Tuck's teachings are limited to the measurement of diameter whereas the present invention pertains to measurement of surface characteristics which involves more than just merely diameter thereby necessitating a different type of sensor, such as the non-contact capacitance sensor or inductance sensor as set forth in claims 1-8, as amended. Hence, Tuck does not teach or suggest the present invention, as set forth in the amended claims. As such, the present invention is not obvious over Tuck.

At page 5 of the Office Action, the Examiner rejects claims 6, 7, 11 and 12 under 35 U.S.C. § 102(b) as being anticipated by Tuck. Reconsideration and withdrawal of this rejection is respectfully requested.

The Examiner asserts that computer driven sensor is suggestive of many measurements to provide for accurate measurement. Claims 6 and 7 are dependent from claim 1, and claims 11 and 12 are dependent from claim 8. Claims 1 and 8 are amended, in pertinent part, to require that the sensor is a capacitance sensor or an inductance sensor and, as discussed above, claims 1 and 8 are neither anticipated by nor obvious over Tuck. Accordingly, claims 6, 7, 11 and 12, which include the limitations of claims 1 and 8, as amended, are neither anticipated by nor obvious over Tuck for the reasons stated above.

At page 6 of the Office Action, the Examiner comments on the remarks made by the applicant in the response filed on September 13, 2005. The remarks made above with respect to the claim rejections in the present Office Action respond to the Examiner's comments. In addition, as discussed above and in the prior response, one skilled in the art of measurement devices and methods for work rolls used in the manufacture of sheet steel and other sheet metal products would not be motivated to combine either Hirayama or Popović, which concern non-contact sensor devices, with the devices of White or Tait which require contact between the sensor and material being analyzed. Hence, the present invention cannot be obvious over either Hirayama or Popovic in view of White or Tait and further in view of Nakumura, Izawa or Honma.

### **Conclusion**

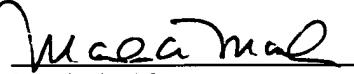
The instant application is believed to be in condition for allowance. A Notice of Allowance of claims 1-20 is respectfully requested. The Examiner is invited to telephone the undersigned at (908) 722-0700 if it is believed that further discussions,

and/or additional amendment would help to advance the prosecution of the instant application.

A petition for a two-month extension of time for this response is enclosed. If a further extension is needed, applicants request that this be considered a petition therefor. Please charge any required petition fee to the Deposit Account No. 14-1263.

Please charge any insufficiency of fees, or credit any excess, to the Deposit Account No. 14-1263.

Respectfully submitted,



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